

Engineering Design

Cip Code: 210115

Course Description

This course is intended to introduce high school students to the engineering design process and the properties of good design. Students will plan, complete, and document a number of analysis-based designs. Skills will be developed in the creation of memos, design reports, and technical drawings using computer aided design. The course content will be covered through a series of hands-on activities.

Goals and Outcomes

1. Recognition of the role of design in society

Students will...

- 1a describe history of engineering design.
- 1b recognize and identify the role of engineering and engineered products in society
- 1c identify the requirements for and role of intellectual property in design
- 1d recall education requirements for professional success as a designer/engineer

2. Identification of the qualities of successful engineering design

Students will...

- 2a be able to identify the qualities of good design and their relationship to the design's user
- 2b be able to examine a design with respect to its quality and usability
- 2c understand that these qualities are the result of choices made and constraints applied during the design process

3. Development of facility with the engineering design process

Students will...

- 3a explain and perform the engineering design process
- 3b be able to create design specifications considering such factors as time and financial resources, ergonomics, safety, and the state-of-of the art.
- 3c be able to locate and utilize a range of electronic, print, human information sources in the creation of a design.
- 3d utilize science and mathematics skills to generate multiple ideas for solving a design challenge and be able to critically evaluate those ideas.
- 3e be explain the role of and be able to utilize mathematical and functional modeling in the creation and assessment of a design.

- 3f be able to build and test their design against design specifications, evaluate the results of that testing, and present their analyses.
- 3g recognize and demonstrate that the design process does not result in a single best design, but instead there are many possible successful designs.
- 3h recognize and demonstrate that design is an iterative process, subject to continuous evolutionary improvement.
- 4. *Planning, documentation and communication of the engineering design process*
Students will...
 - 4a develop plans for the completion of an engineering design.
 - 4a.1 be able to develop a project charter
 - 4a.2 identify the steps required for completion of a specific project
 - 4a.3 be able to create a PERT chart
 - 4a.4 define and identify the critical path in a PERT chart
 - 4b communicate and document engineering designs
 - 4b.1 prepare and maintain a design notebook
 - 4b.2 communicate their progress to others with memo
 - 4b.3 organize and prepare a design report
 - 4b.4 be able to present their designs to others.
- 5 *The Use of Computer Aided Design Software*
Students will...
 - 5a Drafting Fundamentals
 - 5a.1 demonstrate proper drawing layout by utilizing scales
 - 5a.2 utilize linetypes and lineweights properly on a drawing
 - 5a.3 understand basic lettering techniques
 - 5b Dimensioning
 - 5b.1 understand basic dimensioning fundamentals
 - 5b.2 demonstrate correct dimensioning techniques
 - 5b.3 compare and contrast baseline dimensioning and continuous dimensioning
 - 5b.4 discuss the importance of geometric dimensioning and tolerances
 - 5c Types of Drawings
 - 5c.1 illustrate orthographic projection drawings
 - 5c.2 illustrate pictorial drawings
 - 5c.3 illustrate section view drawings
 - 5c.4 illustrate thread and fastener drawings
 - 5c.5 illustrate auxiliary view drawings
 - 5c.6 illustrate revolution drawings
 - 5c.7 create developments
 - 5c.8 illustrate assembly drawings
 - 5d 3D Parametric Modeling

- 5d.1 apply basic drafting fundamentals utilizing 3D modeling software
- 5d.2 utilize the 2D sketch tools
- 5d.3 utilize the extrude tools
- 5d.4 utilize the revolve tools
- 5d.5 utilize the hole tools
- 5d.6 utilize the advanced 3D modeling tools
- 5d.7 utilize the 3D modification tools